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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/580,394	05/22/2006	Kyung Sang Cho	PHO0024US	1954

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CANTOR COLBURN, LLP
20 Church Street
22nd Floor
Hartford, CT 06103

EXAMINER	
BREVAL, ELMITO	

ART UNIT	PAPER NUMBER
2889	

NOTIFICATION DATE	DELIVERY MODE
01/07/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

usptopatentmail@cantorcolburn.com

Office Action Summary	Application No.	Applicant(s)	
	10/580,394	CHO ET AL.	
	Examiner	Art Unit	
	ELMITO BREVAL	2889	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 October 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

The amendment filed of 10/12/2009 has been entered.

Claims 1-9 are pending.

Claim 10 is newly added.

Response to Arguments

Applicant's arguments filed 10/12/2009 have been fully considered but they are not persuasive. The applicant argues the rejection under U.SC. 102(e) is improper for the following reasons; (1), Jain (US. 6,797,412) dielectric layer (28) is not equivalent to applicant electron transport layer; (2), Jain does not teach the cladded nanocrystals (CNCs') is inorganic. The applicant further argues that the rejection under U.S.C. 103 (a) is improper for the following reasons; (1), Bulovic ('2004/0023010) does not teach an inorganic quantum dot light emitting layer; instead, Bulovic teaches an Alq3 light emitting layer; (2) Bulovic does not teach an inorganic electron transport layer formed between the inorganic quantum dot light-emitting layer and the top electrode.

In response to applicant first argument: that Jain dielectric layer is not equivalent to applicant electron transport layer. The examiner respectfully disagrees. First, the applicant claimed limitation "electron transport layer" is made of materials such as Si3N3, Ta2O3, BaTiO3, Al2O3, and these materials are in fact dielectric materials. Jain in the other hand teaches the dielectric layer is made of materials such as SiON, Ta2O5, BaxSr1-xTiO3 (col. 5, lines 40-42). Therefore, Jain dielectric layer is equivalent with the electron transport layer of the applicant.

Regarding the second argument: Jain teaches (in col. 2, lines 58-59) a pseudomorphic cladded quantum dot nanophosphor material. Therefore, the 102 rejection is proper and maintained.

Regarding the first argument of the 103 rejection that Bulovic reference does not teach an inorganic quantum dot light emitting layer: the examiner respectfully disagrees. Bulovic teaches (in paragraph [0027]) an emissive layer can be included between the hole transport layer and the electron transport layer and the emissive layer can include a plurality of nanocrystals. In paragraph ([0033]) Bulovic further teaches the nanocrystals can include group III-V, group II-VI compound nanocrystals including CdS, CdSe, ZnS, ZnTe, HgS, HgSe and HgTe. The materials for Bulovic light emitting layer are the same materials of the applicant quantum dot layer.

Regarding the second argument, Bulovic does not expressly disclose an inorganic electron transport layer. However, Kishigami (JP: 2000-215984) the secondary reference does teach a light emitting device comprised of, in part, an inorganic electron transport layer made of the same material as the electron transport layer of the applicant (abstract; [0028]). One of ordinary skill in the art would easily contemplate to substitute the inorganic electron transport layer of Kishigami in the device of Bulovic for the purpose of providing an electroluminescent device capable of continuously and stably emitting light for a long time with a high luminance. Therefore, the 103 rejection is maintained.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 1 is rejected under 35 U.S.C. 102(e) as being anticipated by Jain et al., (US. Pat: 6,797,412) of record.

Regarding claim 1, Jain ('412) teaches (in at least figs. 6, 8, 9, and 10) a quantum dot light emitting device comprising: a top electrode (29), a bottom electrodes (27) disposed substantially opposite the electrode; an inorganic quantum dot light emitting layer (15; col. 5, lines 35-36; col. 2, lines 55-59) provided between the top electrode (29) and the bottom electrode (27), an inorganic electron transport layer (28 or ; i.e. the dielectric layer; note: the applicant electron transport layer is made of materials such as TiO2, SiO2, ZnO, Ta2O3 and Jain dielectric layer is made of materials such as Ta2O5, SiON; see col. 5, lines 40-43; i.e. both layers are made of dielectric materials) is disposed between the inorganic quantum dot light-emitting device layer (15) and the top electrode (29).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bulovic et al., (US. Pub: 2004/0023010) of record in view of Kishigami (JP: 2000-215984) of record.

Regarding claim 1, Bulovic ('010) teaches (in at least fig. 1) a quantum dot light emitting device comprising: a top electrode (5); a bottom electrode (2) disposed substantially opposite the top electrode; an inorganic quantum dot light emitting layer (not shown; [0027]) provided between the top electrode and the bottom electrode; and an electron transport layer (4) is disposed inorganic quantum dot light emitting layer and the top electrode.

However, Bulovic ('010) does not disclose the electron transport layer is inorganic.

Further regarding claim 1, Kishigami ('984) teaches (abstract) a light emitting device comprised of, in part, a luminescent layer (4), an inorganic electron transport layer (3) disposed between the luminescent layer (4) and a top electrode (2) for the purpose of providing an electroluminescent device capable of continuously and stably emitting light for hours with a high luminance.

Hence, it would have been obvious to one of ordinary skill in the art at the time the invention was made to contemplate of replacing the electron transport layer of Bulovic with the inorganic electron transport layer of Kishigami for the purpose of

providing an electroluminescent device capable of continuously and stably emitting light for a long time with a high luminance.

Regarding claim 2, Bulovic as modified by Kishigami teaches the light emitting device comprises a substrate (1) disposed beneath the bottom electrode (2); and a hole transport layer (3; [0027]) disposed on the bottom electrode, wherein the bottom electrode is an anode and the top electrode is a cathode, and wherein bottom electrode (2), the hole transport layer (3), the inorganic quantum dot light emitting layer (not shown; [0027]), the inorganic transport layer (3 of Kishigami) and the cathode (5) are formed in this order on the substrate.

Regarding claim 3, Kishigami ('984) teaches (in [0028]) the inorganic electron material is selected from CdS, ZnO. The reason for combining is the same as for claim 1.

Regarding claim 4, Bulovic ('010) teaches (in paragraph [0033]) the inorganic quantum dot light emitting layer is made of a material selected from the group consisting of: group III-V compound nanocrystals including CdS, CdSe, ZnS, ZnTe, HgS, HgSe and HgTe.

Regarding claim 5, Bulovic as modified by Kishigami teaches the inorganic electron transport layer can be formed by spin coating, vapor deposition ([0030] of Bulovic).

Regarding claim 6, Bulovic ('010) teaches (in paragraph [0029]) the hole transport layer is made of TPD.

Regarding claim 7, Kishigami ('984) teaches (in [0028]) the inorganic electron material is selected from CdS, ZnO. The reason for combining is the same as for claim 1.

Regarding claim 8, Bulovic ('010) teaches (in paragraph [0033]) the inorganic quantum dot light emitting layer is made of a material selected from the group consisting of: group III-V compound nanocrystals including CdS, CdSe, ZnS, ZnTe, HgS, HgSe and HgTe.

Regarding claim 9, Bulovic as modified by Kishigami teaches the inorganic electron transport layer can be formed by spin coating, vapor deposition ([0030] of Bulovic).

Regarding claim 10, Bulovic ('010) teaches (in at least fig. 1) a quantum dot light emitting device comprising: a top electrode (5); a bottom electrode (2) disposed substantially opposite the top electrode; an inorganic quantum dot light emitting layer (not shown; [0027]) provided between the top electrode and the bottom electrode; and an electron transport layer (4) is disposed inorganic quantum dot light emitting layer and the top electrode.

However, Bulovic ('010) does not disclose the electron transport layer is inorganic; wherein the inorganic electron transport layer includes an oxide selected from group consisting of TiO2, ZnO, SiO2, SnO2, WO3, Ta2O3, BaTiO3, BaZrO3, ZrO2, HfO2, Al2O3, Y2O3, and ZrSiO4; the nitride Si3N4; or a semiconductor compound selected from the group consisting of CdS, ZnSe and ZnS.

Further regarding claim 10, Kishigami ('984) teaches (abstract) a light emitting device comprised of, in part, a luminescent layer (4), an inorganic electron transport layer (3) disposed between the luminescent layer (4) and a top electrode (2); and wherein the electron transport layer comprises a material selected from the group consisting of CdS and ZnO ([0028] for the purpose of providing an electroluminescent device capable of continuously and stably emitting light for hours with a high luminance.

Hence, it would have been obvious to one of ordinary skill in the art at the time the invention was made to contemplate of replacing the electron transport layer of Bulovic with the inorganic electron transport layer of Kishigami for the purpose of providing an electroluminescent device capable of continuously and stably emitting light for a long time with a high luminance.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ELMITO BREVAL whose telephone number is (571)270-3099. The examiner can normally be reached on M-F (8:30 AM-5:00 Pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Toan Ton can be reached on (571)-272-2303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

December 22, 2009
/Elmito Breval/
Examiner, Art Unit 2889

/Bumsuk Won/
Primary Examiner, Art Unit 2889